### Meteor

As meteors are rarely seen by day, I write to inform you that I observed one this morning, at exactly 10.20 A.M., not only in broad daylight, but in bright sunshine. I only caught a hasty glance of it as it was disappearing. It was in the eastern side of the sky, descending towards a point in the horizon nearly due north from us, at an angle of about 40°. As we are quite in the country, it could not have been anything else than a meteor. I found that two of our servants had seen it also, and described it as having a tail, which I did not see. JAMES ELLIOT

Goldielands, near Hawick, March 25

### The Bermuda Lizard

In his "Geographical Distribution of Animals" (Am. ed. ii. p. 135), Mr. Wallace states, speaking of the Bermudas, that "a common American lizard, *Plestiodon longirostris*, is the only land reptile found on the islands."

*Plestiodon longirostris* is not a common American species. It is peculiar to the larger islands of the Bermuda Archipelago. It was described by Prof. E. D. Cope (*Proceedings* of the Academy of Natural Sciences, Philadelphia, 1861, p. 313) from Bermuda specimens. It has never been found elsewhere. Its closest affinities are with a West African species.

G. BROWN GOODE

U.S. National Museum, Washington, January 21

### Landslip near Cork

The village of Coachford, on the River Lee, sixteen miles from Cork, has been the scene of a curious landslip, or subsidence of soil.

On Wednesday, the 13th inst., a man on his way to work, at about eight o'clock A.M., on going along a path beside a dyke or bank which separates two fields close to the village, noticed a breach in the dyke which had not existed before; and on going to examine, found a deep hole in the earth about a yard in diameter, the depth of which appeared to him to be about a hundred feet, and at the bottom of which he heard the sound of running water. From that time till six o'clock P.M. the hole gradually increased in diameter by the falling in of the sides, until it appeared as I saw it on Sunday, the 17th inst., a conical cavity fifty to sixty feet in diameter and thirty to forty in depth.

The soil is composed of gravel and sand, with a substratum of limestone.

The same thing has evidently taken place several times before in the immediate vicinity of the above-mentioned cavity, as there are no less than seven other similar depressions of various sizes in the same piece of ground, but the formation of none of these is remembered by even the oldest inhabitants of the place.

I should mention that the fields between which the landslip has taken place lie pretty high, and that the River Lee is about half a mile distant. A belief has long existed in the village that a stream, which is supposed to flow into the Lee, runs beneath the place, at some depth underground.

Cork, March 20 C. J. COOKE

## *JOACHIM JOHN MONTEIRO*

A FEW days ago (NATURE, vol. xvii. p. 391) we recorded the melancholy fact of the death of this enterprising African traveller. We have since been favoured with a few particulars of his life and labours, which appear to us to demand more than a passing word of recognition. His work on "Angola and the River Congo" (Macmillan, 1875) is still fresh in the mind of the public, and has been made doubly interesting through the recent travels of Mr. Stanley. Mr. Monteiro commenced his scientific education at the Royal School of Mines, under the late Sir H. De la Beche, and at the College of Chemistry under Dr. Hoffmann, at both of which places he obtained first-class honours. His first visit to Angola was in the year 1858, when he went to work the Malachite deposits at Bembe, in that province, and also the blue carbonate of copper. This obtained honourable mention in the International Exhibition of 1862. It was while working these deposits at Bembe that the King of Congo came down to pay a visit, and was received with all honours. A very curious letter from this king, asking for a "piece of soap to wash his clothes with," is now in the possession of the British Museum.

It was during his stay at Bembe, and while exploring the country round, that he discovered that the fibre of the *Adansonia digitata* was so valuable for the purposes of making paper, but it was not until 1865 that he returned to the coast for the purpose of developing this extraordinary discovery. He continued to work this enterprise for many years, so as to fully establish the claim of this fibre to being the most valuable natural product for paper-making. Paper made exclusively of this fibre is scarcely to be distinguished from parchment, and it is owing to this remarkable quality that a small percentage of the fibre enables the manufacturer to utilise substances which would be otherwise useless. While at Bembe Mr. Monteiro procured some of the most interesting birds, and although the results of his first collecting were perhaps not so important in regard to novelties as those made later on, the value of this, our first contribution to the avifauna of Inner Angola, will never be underrated by ornithologists. In September, 1866, he accompanied Mr. A. A. Silva, the United States Consul, on an ascent of the River Quanza for the purpose of opening up the country to trade, and the natives were greatly astonished at their first experience of a "smoke-vessel." In April, 1873, he had the brothers Grandy as his guests at Ambriz, and supplied them with beads and goods for the arduous undertaking assigned to them by the Royal Geographical Society, of endeavouring to discover the sources of the River Congo, and of aiding Livingstone should he cross the continent and make for the West Coast. Mr. Monteiro accompanied the brothers Grandy five days inland. He explored the Congo as far as Porto da Lenho, in a steamer belonging to a Dutch house at the mouth of the river; and it was while on this expedition that he met by appointment, and at their desire, nine kings of Boma, whose curiosity he greatly excited by being the owner, as they said, of the first white woman, his wife, they had ever seen, and from her hand the kings were greatly pleased to receive a "dash" or present.

Mr. Monteiro was honoured with the friendship of Dr. Livingstone, who strongly desired him to accompany his expedition as mineralogist, but this wish he could not accede to, owing to his engagements in working out the fibre-scheme on the West Coast. His researches in the natural history of Angola have been of great importance to science. Among the many botanical specimens which he forwarded to England may be mentioned the plant and flowers of *Welwitschia mirabilis*, from which Sir Joseph Hooker was enabled to compile his splendid monograph of this extraordinary plant; besides many parasites, orchids, &c., which have been named after him. Perhaps the most interesting animal discovered by him was the beautiful little lemur (*Galago monteiri*), and the well-known chimpanzee, "Joe," which lived so long in the Zoological Gardens, was also brought to England by him. His second collection of birds was described by Dr. Hartlaub in 1865, and contained many new species, the most interesting of which were a Hornbill (*Tockus monteiri*) and a Bustard (*Otis picturata*), while he also procured a living specimen of the splendid Plantain-eater (*Corythaix livingstonii*) discovered by Dr. Livingstone in the Zambesi country.

Mr. Monteiro's eighth, and, as it has unfortunately proved, his last, visit to Africa, was one to Delagoa Bay, and here he expired, after a severe illness, on the 6th of January last. In company with his wife, who contributed so largely to his natural history collections, at which she worked with equal courage and zeal, he had set himself to develop the mineral and natural products of that Portuguese possession, and had already sent to England many valuable specimens, when his untimely death put an end

to all his projects. There can be no doubt that Angola, to the elucidation of the natural history of which Mr. Monteiro contributed so largely, still presents a fine field for the collector, and it is to be hoped that some one will be found who will continue the researches so well instituted by the deceased traveller.

## SOUND COLOUR-FIGURES

THE great interest excited by Prof. Bell's telephone and Mr. Eddison's phonograph, in which an elastic disc or membrane faithfully takes up the highly complex vibrations due to sounds of the human voice, has directed renewed attention to the optical methods hitherto employed in studying the motion of resonant media. These have, in important instances, been based on observations of the secondary effects produced by sonorously vibrating bodies. Thus Chladni watched the behaviour of sand strewn upon sounding plates and membranes; König that of gas flames acted on by aërial vibrations. The present article describes an analogous method depending on the colours reflected from slightly viscous liquid films when thrown into sonorous vibration.

The ordinary phenomena called the "colours of thin plates" are sufficiently well known, but a short description of them, taken from a standard work on Physical Optics, may still not be out of place here as a reminder.

"If the mouth of a wine-glass be dipped in water, which has been rendered somewhat viscid by the mixture of soap, the aqueous film which remains in contact with it after emersion will display the whole succession of these phenomena. When held in a vertical plane, it will at first appear uniformly white over its entire surface; but, as it grows thinner by the descent of the fluid particles, colours begin to be exhibited at the top, where it is thinnest. These colours arrange themselves in horizontal bands, and become more and more brilliant as the thickness diminishes; until finally, when the thickness is reduced to a certain limit, the upper part of the film becomes completely black. When the bubble has arrived at this stage of tenuity, cohesion is no longer able to resist the other forces which are acting on its particles, and it bursts."—(Lloyd's "Wave-Theory of Light," p. 100.)

If the film, instead of remaining at rest, is thrown into sonorous vibration, totally distinct colour-phenomena instantly present themselves. A rough idea of their general character may be obtained without the aid of any apparatus as follows. While washing the hands, after getting a good lather, a film can easily be formed between the thumb and forefinger of one hand held in a horizontal plane; the other hand supplies an extemporised tube through which a note can be sung, and so vibrations caused to impinge on the *lower surface* of the film.

If this is done the reflected colours will be seen to be in regular motion, and, in particular, a number of small eddies of colour will be observed whirling about fixed centres of rotation. Steady coloured bands may also be sometimes recognised, but with much greater difficulty.

Fixed bands and stationary vortices form, in fact, the constituent elements of all the sound colour-figures obtainable by film-reflection.

In order to study these in detail a specially arranged apparatus is, of course, requisite. I have found the following give excellent results.

An L-shaped cylindrical brass tube is permanently fixed upon a wooden stand, with its two limbs vertical and horizontal. The vertical limb terminates in a narrow flat circular ring. The open orifice of the horizontal limb is fitted into a caoutchouc tube of equal bore, ending in a trumpet-shaped mouth-piece. For the purpose of supporting the films operated on, I use a series of metallic discs pierced with apertures of various shapes and sizes. On covering one of these, by means of a camel-hair brush, with some weak solution of soap,[1] a film of considerable durability will be formed upon it. The disc should first be held in a vertical plane until the coloured bands have begun to show themselves, and then laid gently upon the horizontal ring prepared for its reception. The observer places himself so as to get a good view of the assemblage of colours reflected by the film, and the instrument[2] is ready for use. Sounds of tuning-forks, whistles, organ-pipes, &c., or notes of the human voice have only to be produced near its mouthpiece, in order that their vibrations may be conducted to the film, and the resulting phenomena observed.

The forms thus presented are of endless variety and great beauty. They almost invariably include both motionless curvilinear bands of colour very regularly disposed, and also a system of colour-vortices revolving about fixed nuclei. The contrast between the steady and moving portions of the figures is always very striking, and the effects of changing tint which accompany the progressive thinning of the film gorgeous in the extreme. When the moment of its dissolution is close at hand, patches of inky blackness invade the field, until at last there is sometimes nothing left but an ebony background, with here and there a few scraps of light, either at rest or still flying round their former orbits, the remnants of fixed bands and whirling vortices.

That the results obtainable by the mode of experimenting above described are likely to present a practically endless variety of form, will be at once obvious from an enumeration of the several causes which may influence the assemblage of colours reflected at a given instant from a given film acted on by the vibrations of a given sound. These are:—1. The shape of the film; 2. Its size; 3. Its consistency; 4. The intensity of the sound; 5. Its pitch; 6. Its quality; 7. The direction in which the sound-vibrations take place with reference to the plane of the film.

It thus appears that each colour-figure observed *may* be a function of not less than seven[3] independent variables; and on experiment this proves to be the fact. An alteration made in any one of these elements, while all the rest are kept constant, produces a corresponding change in the appearances observed. The intensity of the sound does not, it is true, affect the form of the figure, but controls the rate of its vortical motion; the louder the sound the more rapid the rotation of the colour-whirls. All the other elements act directly on form.

It is evident from what has preceded that an attempt at anything like a general classification of sound colour-figures would afford materials for a considerable volume. All that can be done within the present narrow limits is to draw attention to a few points of special interest.

*Dependence of Form on Pitch.*—This is perhaps most distinctly shown by alternately stroking with a resined bow two mounted tuning-forks of different pitch, the open ends of whose resonance-boxes are placed close to the mouthpiece of the Phoneidoscope. As long as the same aperture is used, and the film kept at one degree of consistency by frequent renewal, each note will instantly call forth its own colour-figure for any number of alternations. This mode of experimenting has the advantage of giving perfectly steady and sharply defined figures. But the successive alterations of form due to changing pitch are more interestingly shown by singing[4] the diatonic or chromatic scale, on some single vowel, into the Phoneidoscope. The complete change of figure consequent on

[1] Castile soap, I find, answers extremely well.

[2] It is manufactured and sold under the title of the "Phoneidoscope," by S. C. Tisley and Co., Philosophical Instrument Makers, 172, Brompton Road, S.W.

[3] A reader of Helmholtz will see that I might have added an eighth element by taking into account differences of phase among partial tones, which, though inoperative on quality, directly affect mode of resultant vibration.

[4] A pitch-pipe with a sliding piston may be substituted for the voice in this experiment.